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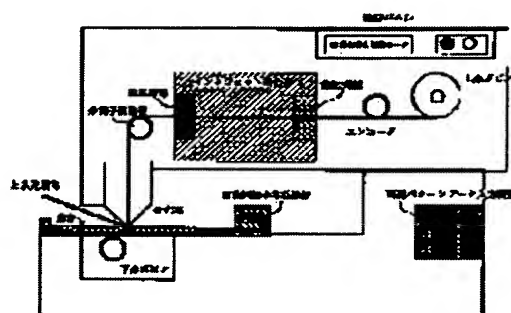
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(54) INK JET DYEING AUTOMATICALLY EMBROIDERING METHOD AND DEVICE THEREFOR

(57)Abstract:

PURPOSE: To provide a method for ink jet-dyeing upper yarn and subsequently automatically embroidering, capable of simply giving the volume of a desired dyestuff solution or a dying pattern with a relatively small device, and to provide the device for ink jet-dyeing and subsequently automatically embroidering, capable of utilizing the three-dimensional expression force of the embroidery and simply expressing highly brilliant colors.

CONSTITUTION: Upper-yarn-dyeing data are formed on the bases of the information of embroidery patterns and the information for detecting the feeding amount of the yarn. The upper yarn is dyed with an ink jet on the basis of the upper yarn-dyeing data, and subsequently automatically embroidered in response to the information of the embroidery patterns. The expression of highly brilliant colors can be achieved with the simple device excellent in operability and embroidery rate and substantially not requiring the switching of the upper yarn.



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CLAIMS

[Claim(s)]

[Claim 1] The ink jet dyeing automatic embroidery approach characterized by carrying out automatic embroidery using a dyed needle thread, moving a base fabric according to embroidery pattern information while creating needle-thread dyeing data based on embroidery pattern information and yarn feed-per-revolution detection information and carrying out ink jet dyeing of the needle thread according to dyeing data.

[Claim 2] It has the yarn feed-per-revolution operation part which calculates a yarn feed per revolution from the rotation detecting element which detects the rotation of the body of revolution supported pivotable while the yarn feed-per-revolution detection means contacted the needle thread, and a rotation. While setting up the zero of a yarn feed per revolution on the needle thread which is in the ink jet dyeing section at the time of automatic embroidery initiation At the time of automatic embroidery initiation, the excessive needle thread from the needle point to the zero of a yarn feed per revolution The ink jet dyeing automatic embroidery approach given in the 1st term of a claim characterized by creating temporary embroidery pattern information according to an embroidery pattern, and carrying out temporary embroidery on a base fabric so that the embroidery starting position on a base fabric and the yarn feed-per-revolution zero of a needle thread may be in agreement.

[Claim 3] The 1st term of a claim characterized by performing amendment of stitch balancing thread tension and dyeing data according to an embroidery property while presuming a base fabric and the embroidery property of a needle thread based on the yarn feed per revolution at the time of temporary embroidery, or the ink jet dyeing automatic embroidery approach given in the 2nd term.

[Claim 4] The ink jet dyeing automatic embroidery approach given in one of the 1st term of a claim thru/or the 3rd term characterized by having constituted the diameter of an ink jet drop from a needle thread small, and considering the same part of a needle thread as the configuration which can be dyed by two or more ink jet drops.

[Claim 5] The device in which the needle thread embroidered is conveyed, and a means to detect the yarn feed per revolution of this needle thread, A means to perform on-demand mold ink jet dyeing before embroidering this needle thread, While carrying out ink jet dyeing of the needle thread according to a means to create needle-thread dyeing data based on the means which carries out after treatment of the dyed needle thread, and embroidery pattern information and yarn feed-per-revolution detection information, and these dyeing data Ink jet dyeing automatic embroidery equipment characterized by carrying out automatic embroidery using the dyed needle thread by which after treatment was carried out, moving a base fabric according to embroidery pattern information.

[Claim 6] The device in which the needle thread embroidered is conveyed, and a means to detect the yarn feed per revolution of this needle thread, A means to perform on-demand mold ink jet dyeing which is smaller than the size of a needle thread before embroidering this needle thread, or carries out the regurgitation of 1/2 or less and the ink droplet 75 micrometers or less of a yarn diameter, While carrying out ink jet dyeing of the needle thread according to a means to create needle-thread dyeing data based on embroidery pattern information and yarn feed-per-revolution detection information, and these dyeing data Ink jet dyeing automatic embroidery equipment characterized by carrying out automatic embroidery using a dyed needle thread, moving a base fabric according to

embroidery pattern information.

[Claim 7] The above-mentioned ink jet dyeing automatic embroidery equipment is the above-mentioned ink jet dyeing automatic embroidery given in the 5th term of a claim or the 6th term equipped with a means to change the number of ink droplets according to the size of yarn.

[Claim 8] The above-mentioned ink jet dyeing automatic embroidery equipment is a day which carries out color display of the above-mentioned embroidery pattern. Ink jet dyeing automatic embroidery equipment given in one of the 5th term of a claim thru/or the 7th term which has a spray and a color specification means to change the color information by which memory is carried out, and forms the above-mentioned embroidery pattern for the changed color information.

[Claim 9] The above-mentioned ink jet dyeing means is ink jet dyeing automatic embroidery equipment given in one of the 5th term of a claim thru/or the 8th term which equips the feed direction of yarn with two or more two or more nozzles from which a color differs in the feed direction of yarn.

[Claim 10] The above-mentioned ink jet dyeing means is ink jet dyeing automatic embroidery equipment given in one of the 5th term of a claim thru/or the 9th term which equips the feed direction of yarn with two or more nozzles from which discharge quantity differs.

[Claim 11] The above-mentioned ink jet dyeing means is ink jet dyeing automatic embroidery equipment given in one of the 5th term of a claim thru/or the 10th term which is leaning the array direction of a delivery a little to the feed direction of yarn.

[Claim 12] Ink jet dyeing automatic embroidery equipment given in one of the 5th term of a claim thru/or the 10th term equipped with a means to change the expulsion-of-an-ink-droplet rate of an ink jet dyeing means according to the dyeing pattern (concentration change of details, or two or more color mixture rate) of yarn in addition to the above-mentioned embroidery pattern.

[Claim 13] Ink jet dyeing automatic embroidery equipment given in one of the 5th term of a claim thru/or the 12th term equipped with the means which carries out an optimal setup of the dyed thread die length and the number of ink jet drops according to stitch balancing thread tension, cloth thickness, and an embroidery thread size.

[Claim 14] Ink jet dyeing automatic embroidery equipment given in one of the 5th term of a claim thru/or the 13th term which has the means which winds the point of yarn rapidly and carries out temporary embroidery of the achromatic section of the above-mentioned needle thread at an embroidery pattern outside.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] About the automatic embroidery approach and the equipment which have the automatic embroidery function perform automatic embroidery on a base fabric based on embroidery pattern information, this invention is specifically a sewing machine, and it relates to the ink jet automatic embroidery approach and the equipment which perform automatic embroidery, performing ink-jet dyeing for a needle thread suitably according to the color information which accompanies an embroidery pattern.

[0002]

[Description of the Prior Art] Although the sewing machine for home use which has business-use automatic embroidery equipment and a business-use automatic embroidery function is already produced commercially and it has spread It is necessary to embroider in piles for every color one by one, creating embroidery pattern information to love and exchanging a needle thread, in exchanging the needle thread for embroidery according to an assignment color and embroidering two or more colors with those conventional equipments. When carrying out automatic embroidery of the multicolor embroidery pattern, great time amount and a great effort were needed. Moreover, if it is necessary to prepare the needle thread for embroidery of various colors and says conversely, the embroidery of the detailed color tone of limited **** is impossible for assignment of an embroidery color in practice to the color number of the needle thread for embroidery. For example, it had to embroider having prepared the needle thread for embroidery according to the number of color tones, and carrying out sequential exchange of the needle thread, even if it was going to perform embroidery using the continuous color tone change (gradation) from deep green to yellow, and the power of expression of embroidery was restrained.

[0003] the textile-printing equipment using an ink jet technique puts in practical use in recent years - - having -- high -- a brilliance print -- although the ground has come to be produced at a simple process, the goodness of embroidery is difficultly improved by the expression with a cubic effect like embroidery. Moreover, it is what passed along the printing roll by the time there is a technique called warp textile printing as a yarn textile-printing technique conventionally, warp came out of **** and it passed along heddle. Understand it as what is gradually printed with the same speed as warp being woven in and going, it is called **, and the yarn first dyed the ground color is used as warp. After it drives cotton yarn into this as the woof and it carries out temporary textile to it at least at intervals of 15cm, there are two typical methods of weaving in the woof of acting before the audience and dying keeping understanding the woof which wound around **** again after removing and printing from the weaving machine, and was driven in at the time of temporary weave. The method of performing warp before finishing weaving as an example of this yarn textile-printing technique not using a printing roll but using an ink jet technique is indicated by JP,59-42093,B, and improvement in power of expression of textile printing of it is enabled. In order to acquire a pattern that it aligned with weaving and coincidence with the textile construction, when the diameter of a nozzle controls the amount or the flight direction of dye liquor which dye liquor is made to blow off according to a pressure operation, an electric-field operation, etc., and is spouted according to the signal (specifically vertical actuation of yarn) which aligned with the textile organization from the dye liquor jet nozzle which has the aperture which is 80 micrometers by the above-mentioned official

report, warp textile printing is carried out at weaving and coincidence. For this reason, the actually breathed-out ink droplet is set to 150 micrometers or more, is larger than the size of usual yarn, and cannot attain dyeing of a desired precision as a result because of overflow of an ink droplet, or a blot. And since dyeing of ink is changed according to vertical actuation of yarn, precision will fall that the attainment situation of an ink droplet tends to be influenced by fluctuation of yarn. Moreover, since the textiles cloth-sized with this official report are further performed with cloth in after treatment, they cannot prevent deterioration.

[0004] And it does not use widely [in order that the configuration of the above-mentioned official report may weave in a complicated pattern, it is difficult to become complicated / the ink jet equipment for controlling the amount or the flight direction of dye liquor /, and large-sized, and to incorporate also with large-sized equipment like weaving equipment, and] from being inferior to the above-mentioned ink jet textile-printing approach of printing a pattern free [in respect of power of expression] with ink jet equipment on cloth.

[0005]

[Problem(s) to be Solved by the Invention] The purpose of this invention is to offer the ink jet dyeing automatic embroidery approach that the desired amount of dye liquor or a desired dyeing pattern can be obtained easily, with comparatively small equipment.

[0006] after other purposes of this invention applied the ink jet technique and employing the three-dimensional power of expression of embroidery efficiently -- high -- a brilliance color expression is excelled in operability, and it aims at offer of the ink jet automatic embroidery equipment of a simple configuration.

[0007]

[The means and operation] which solve a technical problem While according to this invention creating needle-thread dyeing data based on embroidery pattern information and yarn feed-per-revolution detection information and carrying out ink jet dyeing of the needle thread according to dyeing data Moving a base fabric according to embroidery pattern information, and it carries out automatic embroidery and depends. In detail [ink jet dyeing automatic embroidery] It constitutes from a rotation detecting element which detects the rotation of the body of revolution supported pivotable while contacting the needle thread in the yarn feed-per-revolution detection means, and yarn feed-per-revolution operation part which calculates a yarn feed per revolution from a rotation. While setting up the zero of a yarn feed per revolution on the needle thread which is in the ink jet dyeing section at the time of automatic embroidery initiation According to embroidery pattern information, create temporary embroidery pattern information, and carry out temporary embroidery on a base fabric so that the embroidery starting position on a base fabric and the yarn feed-per-revolution zero of a needle thread may be in agreement in the excessive needle thread from the needle point to the zero of a yarn feed per revolution at the time of automatic embroidery initiation. While presuming the embroidery property of a base fabric based on the yarn feed per revolution at the time of temporary embroidery, according to an embroidery property, amendment of stitch balancing thread tension and dyeing data is performed. Or further By constituting the diameter of an ink jet drop from a needle thread small, and considering the same part of a needle thread as the configuration which can be dyed by two or more ink jet drops after applying the ink jet technique and employing the three-dimensional power of expression of embroidery efficiently -- high -- it became possible to excel a brilliance color expression in operability and an embroidery rate as fundamentally unnecessary in a needle-thread change, and to offer the ink jet dyeing automatic embroidery equipment of a simple configuration.

[0008]

[Example]

(The 1st example) The main configurations of the ink jet dyeing section of a needle thread in the ink jet dyeing automatic embroidery equipment of the 1st example of this invention and the embroidery section are shown in drawing 1 . If dyeing / embroidery process of the needle thread in the ink jet dyeing automatic embroidery equipment of this example is explained simple After going around the spool with a rotary encoder which is the yarn feed-per-revolution detecting-element material for detecting the feed per revolution of a needle thread and setting [location / dyeing] up first, the needle thread for embroidery currently wound around the needle-thread bobbin supported by the

needle-thread bobbin receptacle pivotable After the pretreatment liquid which is sent out to the pretreatment section of ink jet dyeing, bleeds, and consists of inhibitors etc. is applied uniformly, it is sent to the ink jet dyeing section. According to the dyeing data created based on embroidery pattern information and yarn feed-per-revolution detection information in the ink jet dyeing section, it is made to synchronize with migration of a needle thread, the ink jet drop of each number of color specification is driven in with ink jet dyeing equipment, and a needle thread is dyed. Automatic embroidery of the dyed needle thread is carried out by the embroidery needle, the bobbin thread, and base fabric free migration equipment which it is sent out at the needle point of the post-embroidery needle which received heating, steam processing, etc. in the after-treatment section which performs fixing and coloring of a stain solution as a process after ink jet dyeing, and is driven according to embroidery pattern information.

[0009] Since the same configuration as conventional automatic embroidery equipment can apply fundamentally the process which carries out automatic embroidery using a predetermined needle thread based on the embroidery pattern information set up beforehand, the detailed configuration of the automatic embroidery section and detailed explanation of operation are omitted, and are explained to a detail about a part of automatic embroidery section relevant to the automatic dyeing process of a needle thread and it by which it is characterized [of this invention].

[0010] Although automatic embroidery is performed with the ink jet dyeing automatic embroidery equipment of this invention, performing ink jet dyeing of a needle thread based on embroidery pattern information, in that case, it is required to set up which part of a needle thread is dyed how. Moreover, since the needle thread from the needle point which actually starts embroidery to the ink jet dyeing section needs to pass each process by the time it starts automatic embroidery, it needs special processing of dyeing beforehand. Then, the zero of a yarn feed per revolution is set up on the needle thread which is in a needle-thread bobbin side by this example rather than the ink jet dyeing section which includes the pretreatment section at the time of automatic embroidery initiation, the needle thread of a needle drawer back is set up as a garbage from a needle-thread zero, temporary embroidery is once performed on a base fabric, and it is considering as the configuration which understands and removes the excessive needle thread by which temporary embroidery was carried out after the completion of automatic embroidery. When the head section of the needle thread by which ink jet dyeing was lapped and carried out on it and a base fabric, judging from embroidery pattern information reaches the needle point, he is trying for the location which performs temporary embroidery to create a temporary embroidery pattern to the appearance by which a base fabric is set to the embroidery initiation section on a base fabric.

[0011] In this example, as shown in drawing 2 , the embroidery starting position and temporary embroidery starting position on a base fabric are set up identically. Drawing 2 (A) has set the temporary embroidery pattern as the appearance to which the die length of the needle thread which is needed for the temporary embroidery which performs temporary embroidery in the location which does not lap with an embroidery pattern from a temporary embroidery starting position, and reaches a temporary embroidery starting position, i.e., an embroidery starting position, again, and the die length of the needle thread from a needle-thread zero to the needle point become equal. In that case, temporary embroidery is performed the die length of a needle thread which is needed in order [, such as the quality of the material thickness, etc. of a base fabric, and the quality of the material, a size of a needle thread,] to reproduce an embroidery pattern therefore differing, or presuming embroidery properties, like the stitch balancing thread tension (optimal tension) of a needle thread differs, and it may be made to perform resetting of a needle-thread zero, dyeing data, and a temporary embroidery pattern according to an embroidery property. Since automatic amendment of this dyeing data can be carried out also at the time of actual automatic embroidery, and it is possible to store on a base fabric at the part of the needle thread which does not appear as an embroidery pattern even if the amendment error (delay) of the some for the needle thread of a needle point arises from the ink jet dyeing section, it is satisfactory practically. Moreover, a number of amendment data about embroidery properties, such as the quality of the material and thickness of a base fabric, and the quality of the material, a size of a needle thread, are created beforehand, and as a user sets up respectively, he may enable it to amend an embroidery property.

[0012] Moreover, drawing 2 (B) is the modification of temporary embroidery, when the embroidery

area of an embroidery pattern is larger enough than temporary embroidery area, setting up a temporary embroidery pattern so that temporary embroidery may be embedded on the substrate of an embroidery pattern may constitute so that it may be selectable, and removal of the needle thread by which temporary embroidery was carried out in that case becomes unnecessary.

[0013] It dyes based on yarn feed-per-revolution detection information, pulling out a needle thread from a needle point manually as a modification of this example, after setting a needle thread, and after setting up manually so that the tip of the dyed needle-thread section may come to the hole location of the needle point, you may make it start automatic embroidery. However, since a constraint is in the processing time in each processes, such as processing liquid spreading, ink jet dyeing, and heating, in each of dyeing pretreatment / dyeing processing / dyeing after treatment of a needle thread, the needle thread in a predetermined yarn drawer rate needs to be manual set up of this example. In that case, a brake mechanism is prepared in the send of a needle thread, it sends out based on yarn feed-per-revolution detection information, and you may make it store a rate in the predetermined range.

[0014] Moreover, also when there is not a pattern with continuous embroidery pattern information but an isolated part, ink jet dyeing automatic embroidery that it can respond and continuous can be realized by using the technique of the temporary embroidery which gave [above-mentioned] explanation, without resetting a needle thread. In that case, even if easy in the removal of a needle thread by which used the function together with well-known automatic yarn, and temporary embroidery was carried out with automatic embroidery equipment, it is good.

[0015] As pretreatment of ink jet dyeing, by this example, in order to make general-purpose yarn usable, the pretreatment function of a needle thread is prepared. If the embroidery needle thread only for ink jet dyeing automatic embroidery equipment is specified and it pretreats beforehand to the needle thread of dedication, it is also possible to consider as the configuration which skipped this process in ink jet dyeing automatic embroidery equipment. Pretreatment of ink jet dyeing in this example mainly bleeds, and is carried out for the purpose of prevention. The cloth processing liquid used with ink jet textile-printing equipment as pretreatment liquid is applicable. Although not illustrated in this example, after applying cloth processing liquid, the squeezing roller has removed excessive pretreatment liquid.

[0016] The configuration of the ink jet dyeing section is shown in drawing 3 . In this example, the ink jet head which carries out the regurgitation of the stain solution of four colors of BK-C-M-Y along the travelling direction of a needle thread and which is eight nozzles at a time respectively is prepared. When the discharge quantity of the stain solution breathed out from each nozzle is set up smaller than the diameter of a needle thread and is converted into a real ball by this example, it is about 40 micrometers in stain solution diameter. When performing ink jet dyeing, as for the diameter of a stain solution, it is desirable to set up smaller than the diameter of yarn, but since it spreads in about about 2 times in an instant when the breathed-out stain solution reaches yarn, what is necessary is just 1/2 or less [of the yarn used more preferably]. Since the needle thread used by this example is the diameter of about 120 micrometers when it sends out with predetermined stitch balancing thread tension (tension), although based also on dyeing concentration to the same part of yarn, the stain solution of each color plurality is constituted in the appearance made to reach the target. Timing is made to take and breathe out, when making cyanogen 4 drop and yellow 4 drop reach the location of eye X pixel from the zero of a ***** bee and the amount of sends of a needle thread, dyeing it Green and eye X pixel of a needle thread counters the location of eight nozzles of C1, C3, C5, C7, Y1, Y3, Y5, and Y7. Since an impact location shifts in the relation between a nozzle, the distance of a needle thread, the send rate of a needle thread, and the regurgitation rate of a stain solution, the regurgitation is performed to the timing which amended the amount of gaps in fact. Therefore, in this example, the impact sequence of a stain solution serves as order of C1, C3, C5, C7, Y1, Y3, Y5, and Y7. The stain solution of the same color is controlled by this example to set up a use nozzle so that impact spacing may be extended in consideration of stain solution osmosis in a low-concentration (when there are few dyeing drops) yarn core part, although he is trying to make the same pixel reach the target up to each color a maximum of 8 drop. For example, when making cyanogen reach the target by four or less drops, he is trying to use an even number nozzle one by one using an odd number nozzle in the case of beyond it. Moreover, in order to make the operating

frequency for every nozzle equalize, when using from the case where it uses from an even number nozzle, and an odd number nozzle, its ascending order and descending order are further changed for every pixel. A random-number circuit may be used so that random assignment of the assignment of a use nozzle may be carried out and it may be carried out as the technique of operating frequency equalization of a nozzle.

[0017] Since nozzle spacing of the ink jet head used by this example is the one apparatus head of 564-micrometer 4 color a total of 32 nozzles between 70 micrometer colors of each color private contract and the maximum drive frequency of a dyeing pixel consistency is 6.12kHz in an equivalent for 360dpi, the maximum yarn feed rates are about 432 mm/sec. Therefore, although based on a seam pitch, a base fabric feed rate, cloth thickness, the quality of the material, etc., the about [- seam pitch 5mm] thing fully corresponded to the rate of automatic embroidery is possible by sewing rate 1800 time stitch/, and the rate of automatic embroidery is not restricted by the dyeing rate of the ink jet dyeing section. Furthermore, what is necessary is to double the number of nozzles of each color of this example, for example, and just to make it use an odd number nozzle and an even number nozzle alternately with a pixel, although various approaches are possible in order to enlarge the rate (the maximum yarn feed rate) of ink jet dyeing.

[0018] Drawing 4 shows the modification of the above-mentioned ink jet head configuration which can be shade changed. (A) is the exploded view of the configuration of a shade head, and (B) is the enlarged drawing of the common liquid room. the ink receptacle which 600 is made to correspond to the ink room which had four filters 700 compartmented, and it has -- it is covering [like] and the uniting [with the heater board 100 / the orifice plate 1300 for nozzle, delivery, and common ink room formation]-through spring 500 of configuration as shown in drawing top plate 1500 is pressed. It can be understood that the detail of this configuration refers to the ink jet recording head of BJ method by Canon, Inc. marketed. A configuration new at drawing 4 is an ink room configuration shown in (B), and high dyeing of gradation nature can be enabled by replacing each nozzle of Y, M, C, and Bk shown by drawing 3 in the same color ink in which concentration differs. Each ink rooms 10a, 10b, 10c, and 10d are divided with Walls 30a, 30b, and 30c, respectively, and the ink of different concentration is received from the ink receiving parts 20a, 20b, 20c, and 20d. In this case, although color record becomes impossible, if an ink room is increased, not only color record but also gradation record of each color depends, and it can attain to altitude.

[0019] The example when the needle thread for embroidery is more remarkable than a dyeing drop and large as a configuration modification of the ink jet dyeing section was shown in drawing 6 . In drawing 6 , it is made to perform dyeing from both sides using two ink jet heads which counter to a needle thread. Drawing 7 is the example constituted without making two ink jet heads counter completely, and he is trying not to be equivalent to the face side of a head where ink Myst generated at the time of the regurgitation of a stain solution counters.

[0020] Drawing 8 is constituted by the appearance in which the absorption member which is the explanatory view of the maintenance device of the recording head in this example, and is the auxiliary discharge appearance receptacle which is made to breathe out a stain solution and is recovered at the wiping member which wipes off foreign matters, such as protection / suction cap used between a needle thread and a recording head at the time of un-using it and suction recovery, and ink Myst, waste thread adhering to a face side, and the time of achromatic is inserted if needed.

[0021] The needle thread dyed in the ink jet dyeing section is made to heat-treat as after treatment of dyeing in this example. You may carry out it being also possible to omit this after treatment depending on the property of pretreatment liquid and a stain solution, for example, heat-treating with an iron etc. after automatic embroidery etc.

[0022] The control-block Fig. of the ink jet dyeing automatic embroidery equipment of this example is shown in drawing 5 . The dyeing data which consist of the dyeing location and dyeing conditions (the color and the number of dyeing drops) of a needle thread like the above-mentioned by drawing 5 based on the embroidery pattern information that it was inputted from the embroidery pattern data entry unit are created, and ink jet dyeing automatic embroidery is performed, amending dyeing data one by one from the yarn feed per revolution according to the embroidery condition at the time of temporary embroidery and embroidery. Embroidery pattern information may be chosen from the pattern beforehand built in storage, such as ROM of automatic embroidery equipment.

[0023] Here, the configuration of drawing 5 is explained briefly. An assignment means 2 to specify [from] the embroidery pattern which 1 is the control panel which the user of equipment operates, and is saved in equipment at the embroidery pattern memory means 6, such as a floppy and random access memory, while being displayed on the display which is not illustrated [a code or], It has a cloth type assignment means 3 to specify cloth types embroidered, such as thickness of cloth, and the quality of the material, and the color specification means 4 convertible into the color of a request of the part or all the predetermined colors of an embroidery pattern. 5 is the amendment means of the foldout conditions of embroidery, and the thread color of the purpose of use amends whether the amount of clinches as ** cost of how much is needed using the information from the cloth type assignment means 3 and the color specification means 4. This information is sent to the dyeing data means forming 12 as condition amendment through CPU7. The thing and this example from which this ** cost serves as a count of a clinch by that pattern and the amount of amendments with the substantial product of the variation of the thickness of cloth in addition to the amount of the needle thread by which the yarn of that color according to a pattern is equivalent to a part for the substantial surface area of a pattern are set up.

[0024] 10 is a data-processing means to disassemble the embroidery pattern which includes color information in consideration of the color specification means 4 (it becomes unnecessary information when there is no modification) according to the specified embroidery pattern into the color corresponding to the ink color with which an ink jet dyeing unit is equipped, and a pattern. This example is changed into four colors of Y, M, C, and Bk, and the translation data processed with the data-processing means 10 is temporarily stored in each pattern memory 11 classified by ink. 19 is the yarn feed-per-revolution detection means mentioned above, distinguishes correctly the feed per revolution of the yarn supplied from the needle-thread feed zone 20, and sends the output to the dyeing data means forming 12. The amendment from the above-mentioned condition amendment means is taken into consideration for the information on the pattern memory 11 classified by ink, data formation of the data according to final color for dyeing is carried out based on yarn feed-per-revolution detection information, and, in response, as for the dyeing data means forming 12, Y, M, C, and the Bk head driver 13 drive the on-demand mold (BJ method) ink jet dyeing unit 14 in consideration of timing amendment of the amount of delay by the arrangement for every color of a head.

[0025] Although any of a configuration of having mentioned above are sufficient as the configuration of the ink jet dyeing unit 14, the pretreatment section 15 which performs well-known pretreatment for raising dyeing of non-chromonemata is formed just before this unit. Of course, since the way of non-chromonemata being needle threads to which this well-known pretreatment was performed beforehand can simplify an equipment configuration, it is desirable. It is the well-known after-treatment section, and by this example, 16 is moisture, recovery, etc. which were generated in the dyeing unit 14, it draws the liquid absorption member (water may be retained periodically) 17 which absorbs the ink discharged from the dyeing unit 14, and is performing after treatment by the elevated-temperature steam with the heating means 18. This uses the moisture of a liquid for a tail end process efficiently while improving the liquid absorptance of the liquid absorption member in the dyeing unit 14. Since this example is a configuration dyed a needle thread, since it is very minute compared with cloth textile printing, the area processed to unit time amount is efficient with such a configuration, and sufficient effectiveness is acquired with a small processor. Therefore, the yarn which passed this after-treatment section 16 is supplied to the sewing-machine device 9 as yarn [finishing / pattern dyeing], and is sewn with cloth migration according to the information on the color specified by the body driver 8 of a sewing machine, and pattern memory, needle migration is performed relatively, and cloth [finishing / embroidery] is manufactured.

[0026] 21 may be the information which shows the zero of the dyeing initiation mentioned above, and may be the judgment information on which location before a tail end process. In addition, the zero information 21 is used as change timing to this embroidery from temporary embroidery mentioned above.

[0027] Like, even if it did not exchange needle threads, various color tones could be easily embroidered with the thing which were explained above and which was carried out to Mr. automatic embroidery ****, carrying out ink jet dyeing of the needle thread for embroidery according to an

embroidery pattern.

[0028] (The 2nd example) Drawing 9 is a block diagram of the ink jet dyeing section used for the ink jet dyeing automatic embroidery equipment of the 2nd example of this example. In this example, it is the example which changes and dyes the number of the ink jet nozzles used according to the needle-thread size specified with the control panel so that optimal dyeing can be performed according to the size of the needle thread for embroidery. The automatic judging of the assignment of the size of a needle thread may be carried out with size detection means, such as a photo sensor which also prepared panel assignment on the yarn delivery path. Since it is a side (this example under) with a yarn guide member, if the size of yarn becomes large, he is trying for the criteria of a needle thread to add a top nozzle suitably by drawing 9 in addition to a lower nozzle.

[0029] Drawing 10 is the modification of this example, and even if it is the physical relationship which a yarn guide and an ink jet head counter and the size of a needle thread became large, after the core of a needle thread considers as the configuration which does not shift from the core of an ink jet head, it shows the example which made the nozzle consistency of a core higher than a periphery.

[0030] By this example, even if the size of the needle thread for embroidery changes, optimal ink jet dyeing can be performed to the appearance explained above.

[0031] (The 3rd example) Although the bobbin thread showed the example which uses a monochromatic thing, without dyeing, it is having constituted from drawing 11 so that ink jet dyeing's might be carried out like [a bobbin thread] a needle thread and automatic embroidery's could be performed, and enabled it to embroider [of a base fabric] various colors with said example.

[0032]

[Effect of the Invention] While carrying out ink jet dyeing of the needle thread according to embroidery pattern information according to this invention By considering as the configuration which carries out automatic embroidery, moving a base fabric according to embroidery pattern information after applying the ink jet technique and employing the three-dimensional power of expression of embroidery efficiently -- high -- it became possible to offer the ink jet dyeing automatic embroidery equipment which is excellent in operability and an embroidery rate considering a needle-thread change as fundamentally unnecessary, and can attain a brilliance color expression with a simple configuration.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The main configurations of the ink jet dyeing section of a needle thread in the ink jet dyeing automatic embroidery equipment of the 1st example of this invention and the embroidery section are shown.

[Drawing 2] the location where (A) does not lap with an embroidery pattern from a temporary embroidery starting position in the explanatory view which sets up identically the embroidery starting position and temporary embroidery starting position on a base fabric, and (B) -- the physical relationship with which these lap is shown.

[Drawing 3] It is the explanatory view of the example of a configuration of the ink jet dyeing section.

[Drawing 4] The modification of an ink jet head configuration which can be shade changed is shown.

[Drawing 5] The control-block Fig. of the ink jet dyeing automatic embroidery equipment of this example is shown.

[Drawing 6] It is the explanatory view of the configuration modification of the ink jet dyeing section.

[Drawing 7] It is the example which constituted configuration deformation of the ink jet dyeing section, without making two ink jet heads counter completely.

[Drawing 8] It is the explanatory view of the maintenance device of the recording head in this example.

[Drawing 9] It is the block diagram of the ink jet dyeing section used for the ink jet dyeing automatic embroidery equipment of the 2nd example of this example.

[Drawing 10] The example to which the core of a needle thread considered as the configuration which does not shift from the core of an ink jet head, and made the nozzle consistency of a core higher than a periphery in the modification of this example is shown.

[Drawing 11] It is ink jet dyeing automatic embroidery equipment constituted so that ink jet dyeing might be carried out like [a bobbin thread] a needle thread and automatic embroidery could be performed.

[Translation done.]

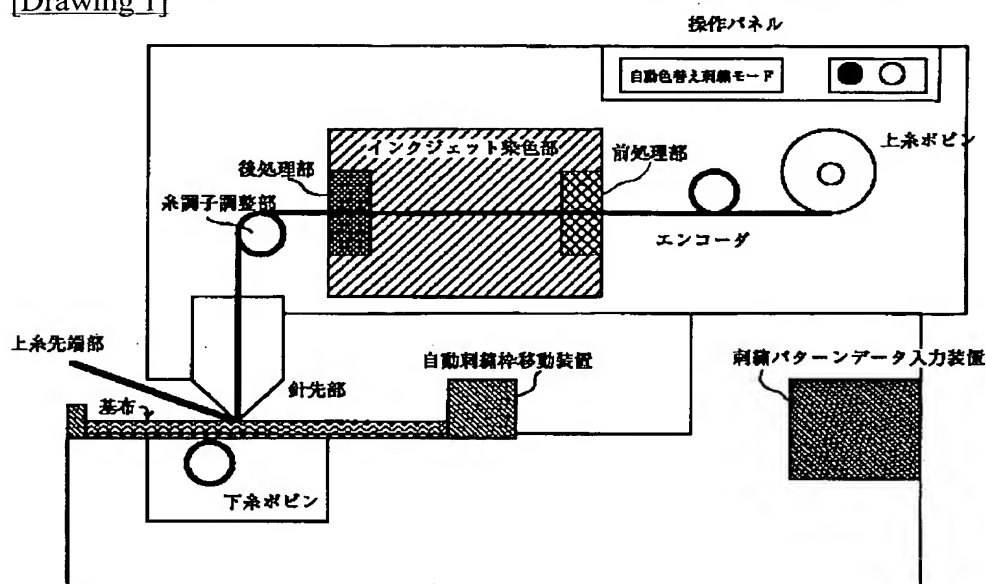
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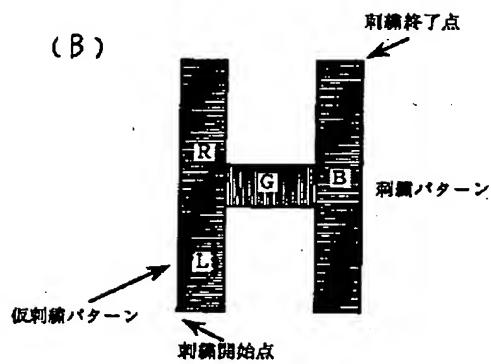
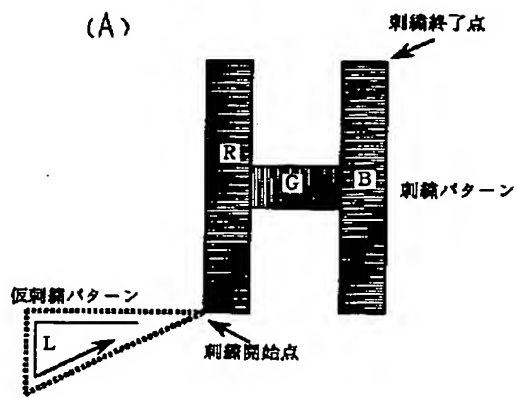
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DRAWINGS

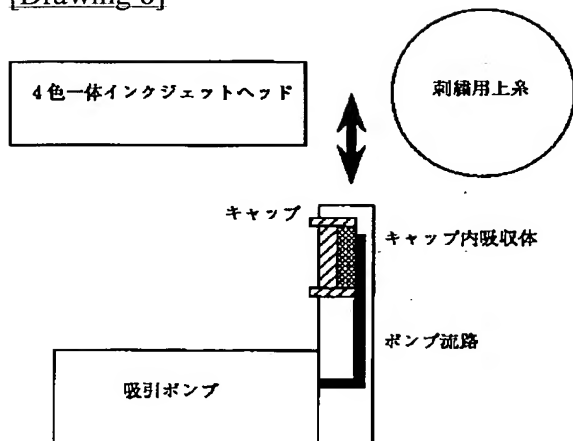
[Drawing 1]



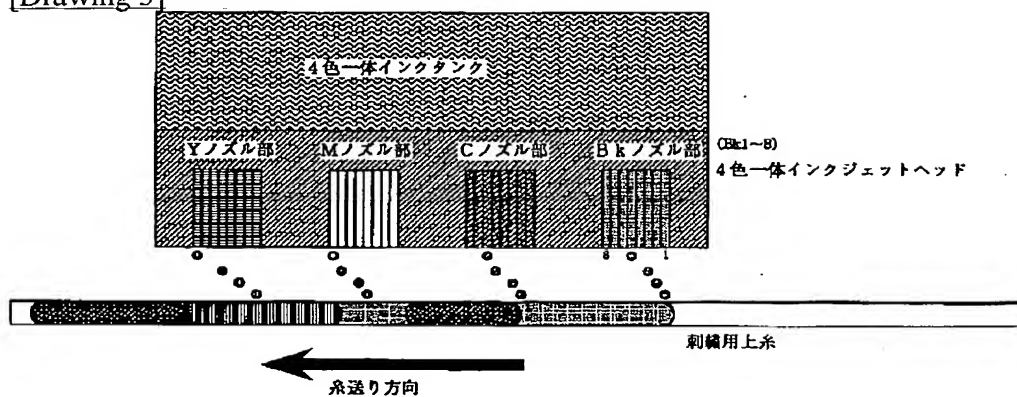
[Drawing 2]

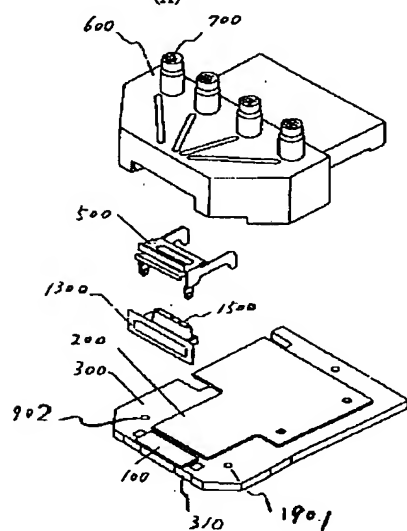


[Drawing 8]

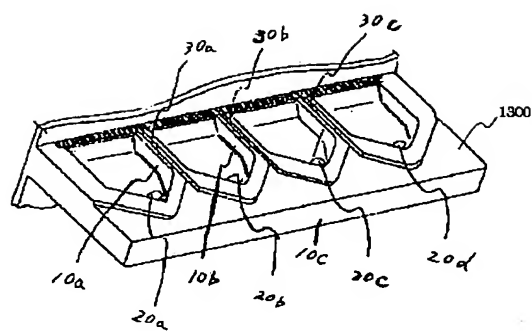


[Drawing 3]



[Drawing 4]
(A)

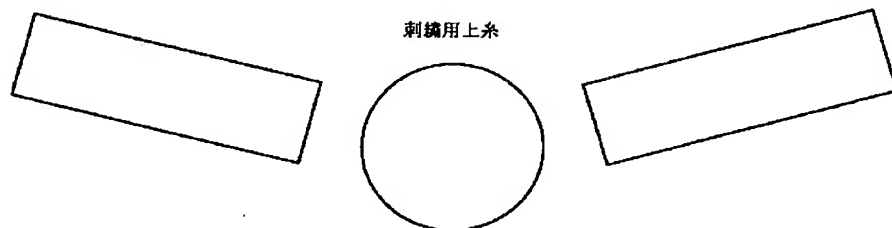
(B)



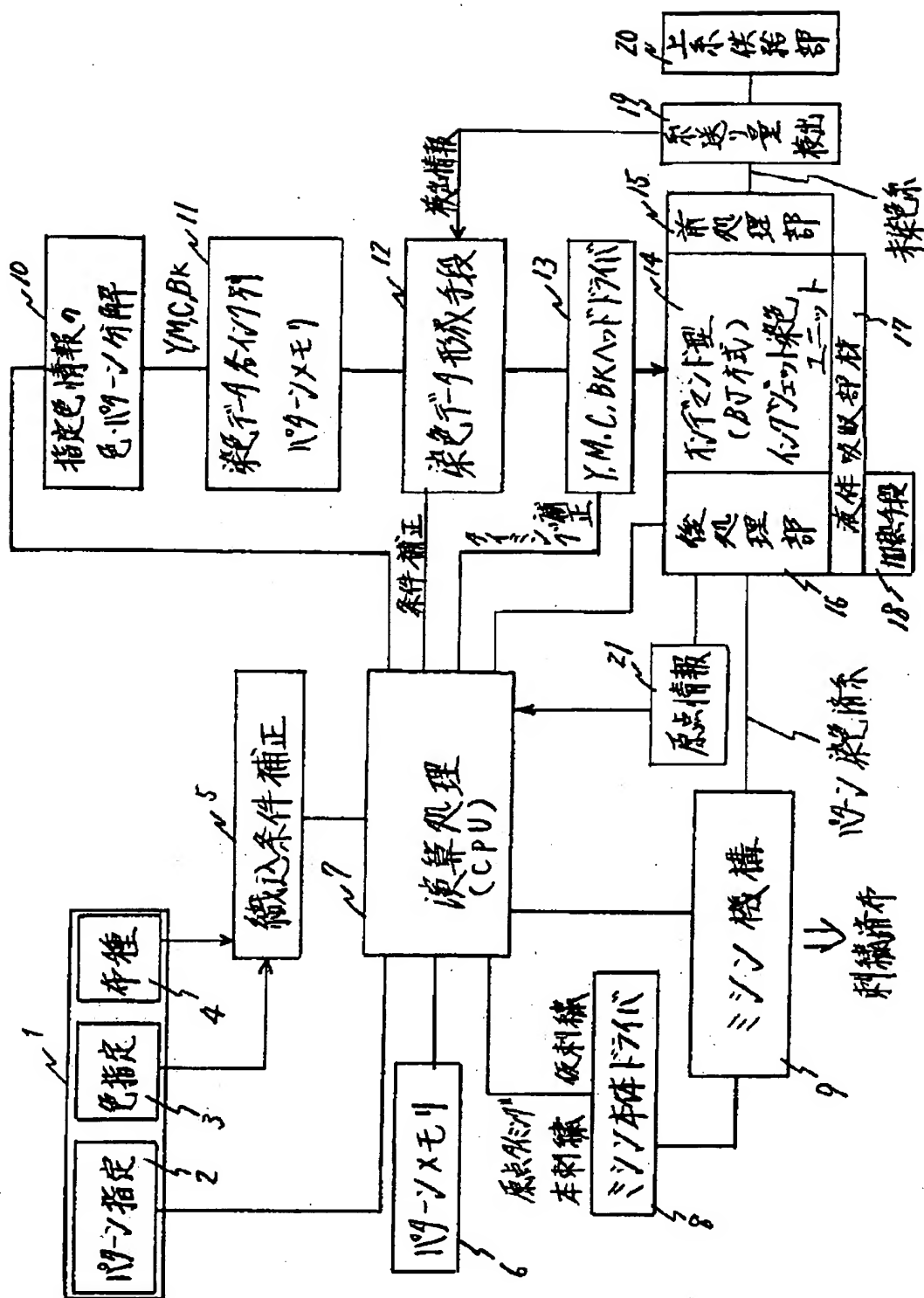
[Drawing 7]

4色一体インクジェットヘッド1

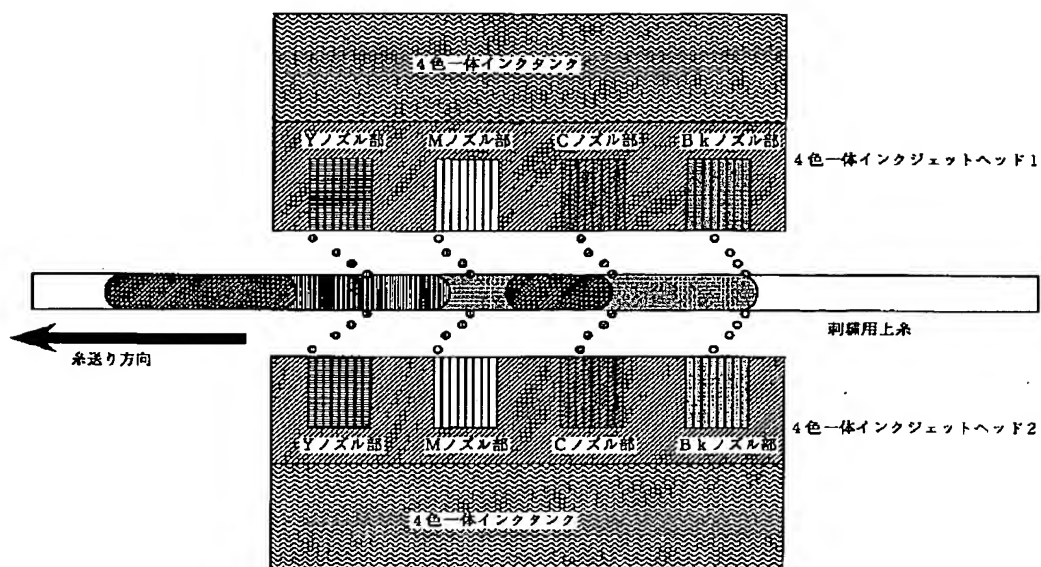
4色一体インクジェットヘッド2



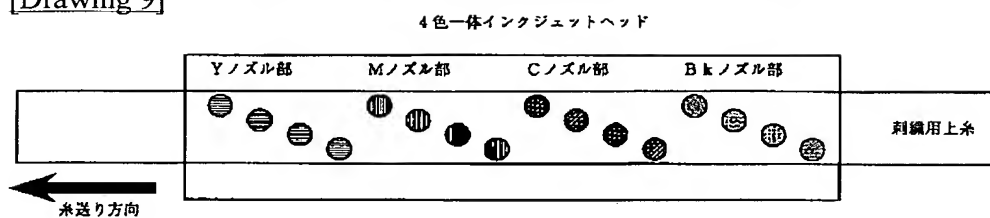
[Drawing 5]



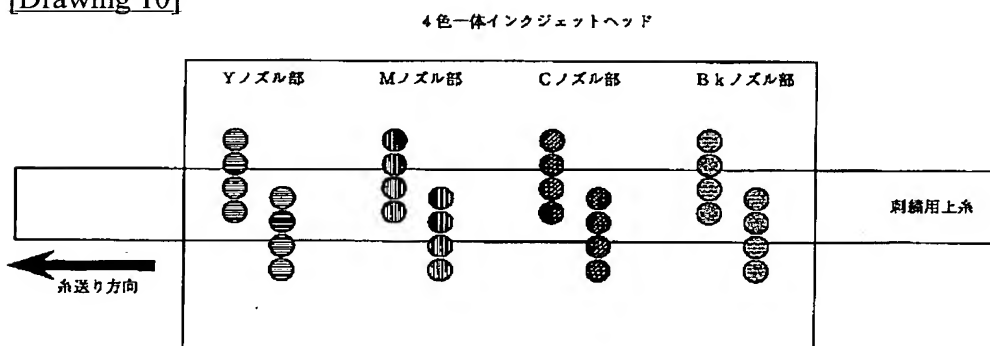
[Drawing 6]



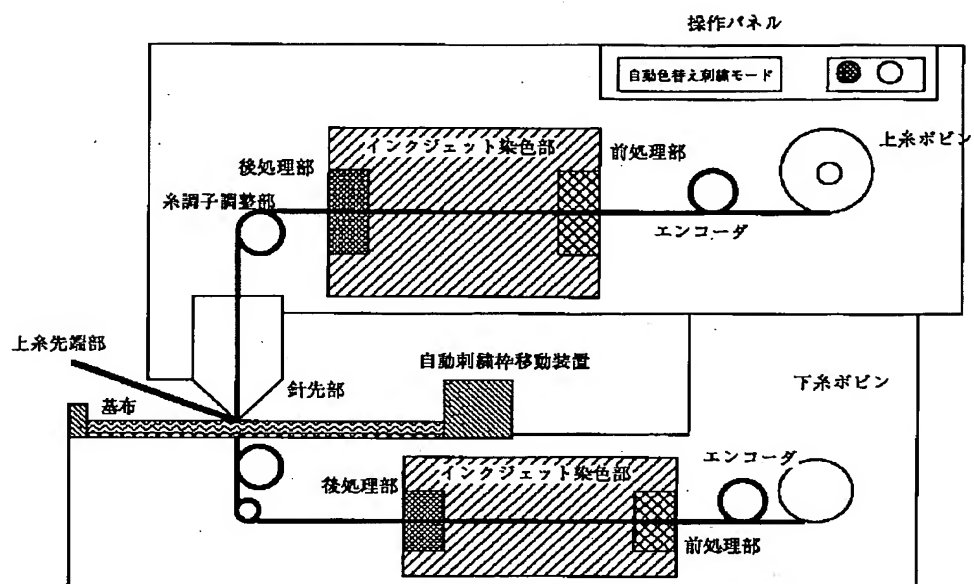
[Drawing 9]



[Drawing 10]



[Drawing 11]



[Translation done.]

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CORRECTION OR AMENDMENT

[Kind of official gazette] Printing of amendment by the convention of 2 of Article 17 of Patent Law
 [Section partition] The 5th partition of the 3rd section
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 5/06

[FI]

D05C 11/24
 5/06

[Procedure revision]
 [Filing Date] June 26, Heisei 10
 [Procedure amendment 1]
 [Document to be Amended] Specification
 [Item(s) to be Amended] The name of invention
 [Method of Amendment] Modification
 [Proposed Amendment]
 [Title of the Invention] The ink jet dyeing embroidery approach and equipment
 [Procedure amendment 2]
 [Document to be Amended] Specification
 [Item(s) to be Amended] Claim
 [Method of Amendment] Modification
 [Proposed Amendment]
 [Claim(s)]
 [Claim 1] The ink-jet dyeing embroidery approach which creates the dyeing data for dyeing said needle thread based on the embroidery pattern information which shows the pattern to embroider, and the yarn feed-per-revolution detection information about the feed per revolution of a needle thread, and is characterized by to embroider the dyed needle thread based on said embroidery pattern information while the ink-jet method which carries out the regurgitation dyes a needle thread for ink according to said dyeing data.
 [Claim 2] Said yarn feed-per-revolution detection information is information acquired by the yarn feed-per-revolution detection means which consists of a rotation detecting element which detects the rotation of the body of revolution supported pivotable while contacting the needle thread, and yarn feed-per-revolution operation part which calculates a yarn feed per revolution from a rotation. While setting up the zero of a yarn feed per revolution on the needle thread which is in the ink jet dyeing

section at the time of embroidery initiation At the time of embroidery initiation, according to embroidery pattern information, temporary embroidery pattern information is created so that the embroidery starting position on a base fabric and the yarn feed-per-revolution zero of a needle thread may be in agreement in the excessive needle thread from the needle point to the zero of a yarn feed per revolution. The ink jet dyeing embroidery approach according to claim 1 characterized by carrying out temporary embroidery on a base fabric based on this temporary embroidery pattern information.

[Claim 3] The ink jet dyeing embroidery approach according to claim 2 characterized by performing amendment of stitch balancing thread tension and dyeing data according to said embroidery property while presuming a base fabric and the embroidery property of a needle thread based on the yarn feed per revolution at the time of temporary embroidery.

[Claim 4] The ink jet dyeing embroidery approach according to claim 1 to 3 characterized by having constituted the diameter of an ink jet drop from said needle thread small, and considering the same part of a needle thread as the configuration which can be dyed by two or more ink jet drops.

[Claim 5] Ink jet dyeing embroidery equipment characterized by embroidering the dyed needle thread to which said after treatment was performed based on said embroidery pattern information while having the following and carrying out ink jet dyeing of the needle thread based on these dyeing data. The device in which the needle thread embroidered is conveyed A yarn feed-per-revolution detection means to detect the yarn feed per revolution of said needle thread An ink jet dyeing means to perform on-demand mold ink jet dyeing before embroidering this needle thread A means to create needle-thread dyeing data based on the means which carries out after treatment of the dyed needle thread, and the embroidery pattern information which shows the pattern to embroider and the yarn feed-per-revolution detection information about the feed per revolution of said needle thread

[Claim 6] Ink jet dyeing embroidery equipment characterized by embroidering a needle thread based on said embroidery pattern information while having the following and carrying out ink jet dyeing of the needle thread based on said dyeing data. The device in which the needle thread embroidered is conveyed A yarn feed-per-revolution detection means to detect the yarn feed per revolution of this needle thread An ink jet dyeing means to perform on-demand mold ink jet dyeing which is smaller than the size of a needle thread before embroidering this needle thread, or carries out the regurgitation of 1/2 or less and the ink droplet 75 micrometers or less of a yarn diameter A means to create needle-thread dyeing data based on the embroidery pattern information which shows the yarn feed-per-revolution detection information acquired by said yarn feed-per-revolution detection means, and the pattern to embroider

[Claim 7] Ink jet dyeing embroidery equipment according to claim 5 or 6 characterized by having further a means to change the number of ink droplets according to the size of yarn.

[Claim 8] Ink jet dyeing embroidery equipment according to claim 5 to 7 characterized by having the display which carries out color display of said embroidery pattern, and a color specification means to change the color information by which memory is carried out, following for the changed color information, and forming an embroidery pattern.

[Claim 9] Said ink jet dyeing means is ink jet dyeing embroidery equipment according to claim 5 to 8 characterized by equipping the feed direction of yarn with two or more two or more nozzles from which a color differs in the feed direction of yarn.

[Claim 10] Said ink jet dyeing means is ink jet dyeing embroidery equipment according to claim 5 to 9 which equips the feed direction of yarn with two or more nozzles from which discharge quantity differs.

[Claim 11] Said ink jet dyeing means is ink jet dyeing embroidery equipment according to claim 5 to 10 characterized by having the delivery train which leaned and arranged two or more deliveries to the feed direction of yarn.

[Claim 12] Ink jet dyeing embroidery equipment according to claim 5 to 10 characterized by having a means to change the regurgitation rate of the ink droplet which carries out the regurgitation of change or two or more colors of the concentration of details from said ink jet dyeing means according to dyeing patterns, such as a rate of making a needle thread intermingled.

[Claim 13] Ink jet dyeing embroidery equipment according to claim 5 to 12 characterized by having a means to set up the number of the ink droplets which carry out the regurgitation to the die length of

a dyed thread, or the needle thread of the specified quantity based on at least one condition among the stitch balancing thread tension of the needle thread used for embroidery, the thickness of cloth, and the size of the needle thread used for embroidery.

[Claim 14] Claim 5th characterized by winding the point of yarn rapidly and having the means which carries out temporary embroidery of the achromatic section of the above-mentioned needle thread at an embroidery pattern outside thru/or ink jet dyeing embroidery equipment given in either of 13.

[Procedure amendment 3]

[Document to be Amended] Specification

[Item(s) to be Amended] 0005

[Method of Amendment] Modification

[Proposed Amendment]

[0005]

[Problem(s) to be Solved by the Invention] The purpose of this invention is to offer the ink jet dyeing embroidery approach and equipment which can obtain easily the desired amount of dye liquor or a desired dyeing pattern with comparatively small equipment.

[Procedure amendment 4]

[Document to be Amended] Specification

[Item(s) to be Amended] 0006

[Method of Amendment] Modification

[Proposed Amendment]

[0006] after other purposes of this invention applied the ink jet technique and employing the three-dimensional power of expression of embroidery efficiently -- high -- a brilliance color expression is excelled in operability, and it aims at offer of the ink jet dyeing embroidery approach of a simple configuration, and equipment.

[Procedure amendment 5]

[Document to be Amended] Specification

[Item(s) to be Amended] 0007

[Method of Amendment] Modification

[Proposed Amendment]

[0007]

[The means and operation] which solve a technical problem It is characterized by for this invention to embroider the dyed needle thread based on said embroidery pattern information while it creates the dyeing data for dyeing said needle thread based on the embroidery pattern information which shows the pattern to embroider, and the yarn feed-per-revolution detection information about the feed per revolution of a needle thread in order to attain the above-mentioned purpose and dyes a needle thread for ink with the ink-jet method which carries out the regurgitation according to said dyeing data. Yarn feed-per-revolution detection information is acquired with the yarn feed-per-revolution detection means which consists of a rotation detecting element which detects the rotation of the body of revolution supported pivotable in more detail while contacting the needle thread, and yarn feed-per-revolution operation part which calculates a yarn feed per revolution from a rotation. While setting up the zero of a yarn feed per revolution on the needle thread which is in the ink jet dyeing section at the time of embroidery initiation At the time of embroidery initiation, according to embroidery pattern information, temporary embroidery pattern information is created so that the embroidery starting position on a base fabric and the yarn feed-per-revolution zero of a needle thread may be in agreement in the excessive needle thread from the needle point to the zero of a yarn feed per revolution. Based on this temporary embroidery pattern information, carry out temporary embroidery on a base fabric. While presuming the embroidery property of a base fabric based on the yarn feed per revolution at the time of temporary embroidery, according to an embroidery property, amendment of stitch balancing thread tension and dyeing data is performed. Or further By constituting the diameter of an ink jet drop from a needle thread small, and considering the same part of a needle thread as the configuration which can be dyed by two or more ink jet drops after applying the ink jet technique and employing the three-dimensional power of expression of embroidery efficiently -- high -- a needle-thread change is fundamentally made unnecessary for a brilliance color expression, it excels in operability and an embroidery rate, and the simple ink jet dyeing embroidery approach of a configuration and ink jet dyeing embroidery equipment are offered.

[Procedure amendment 6]

[Document to be Amended] Specification

[Item(s) to be Amended] 0032

[Method of Amendment] Modification

[Proposed Amendment]

[0032]

[Effect of the Invention] While carrying out ink jet dyeing of the needle thread according to the embroidery pattern information which shows the pattern to embroider according to this invention By considering as the configuration which embroiders the dyed needle thread to a base fabric according to embroidery pattern information after applying the ink jet technique and employing the three-dimensional power of expression of embroidery efficiently -- high -- a brilliance color expression It became possible to offer the ink jet dyeing embroidery approach that it excels in operability and an embroidery rate as fundamentally unnecessary, and the change of a needle thread can be attained with a simple configuration, and ink jet dyeing embroidery equipment.

[Translation done.]

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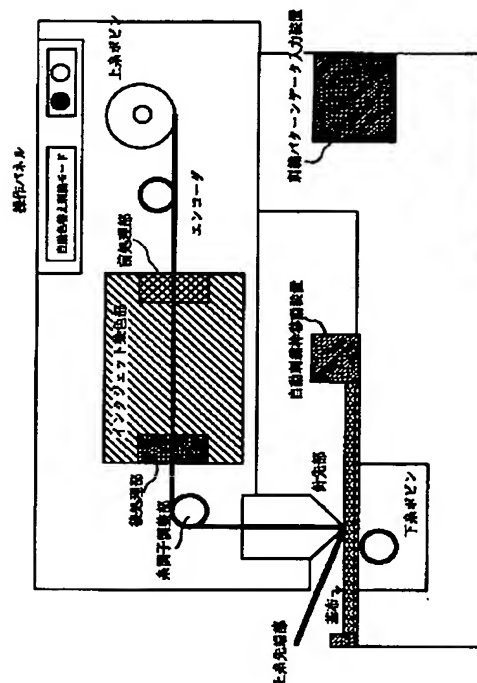
(54)【発明の名称】 インクジェット染色自動刺繍方法及び装置

(57)【要約】

【目的】 比較的小型の装置で所望の染液量或は、染色パターンを簡単に得ることの出来るインクジェット染色自動刺繍方法及び、刺繍の立体的な表現力を生かした上で高精彩な色表現を操作性に優れかつ簡易な構成のインクジェット自動刺繍装置の提供を行う。

【構成】 刺繍パターン情報と糸送り量検出情報とに基づき上糸染色データを作成し、上糸をインクジェット染色し刺繍パターン情報に応じて自動刺繍する。

【効果】 高精彩な色表現を上糸切り替えを基本的に不要として操作性および刺繍速度に優れかつ簡易な構成で達成できた。



【特許請求の範囲】

【請求項1】 刺繍パターン情報と糸送り量検出情報とに基づき上糸染色データを作成し、染色データに応じて上糸をインクジェット染色するとともに、刺繍パターン情報に応じて基布を移動しつつ染色済上糸を用いて自動刺繍することを特徴とするインクジェット染色自動刺繍方法。

【請求項2】 糸送り量検出手段は上糸に当接するとともに回転可能に支持された回転体の回転量を検出する回転量検出部と回転量から糸送り量を演算する糸送り量演算部とを有し、糸送り量の原点を自動刺繍開始時にインクジェット染色部にある上糸上に設定するとともに、自動刺繍開始時に針先から糸送り量の原点までの余分な上糸を、基布上の刺繍開始位置と上糸の糸送り量原点とが一致するように刺繍パターンに応じて仮刺繍パターン情報を作成し基布上に仮刺繍することを特徴とする請求項第1項記載のインクジェット染色自動刺繍方法。

【請求項3】 仮刺繍時の糸送り量に基づいて基布及び上糸の刺繍特性を推定するとともに、刺繍特性に応じて糸調子および染色データの補正を行うことを特徴とする請求項第1項又は第2項記載のインクジェット染色自動刺繍方法。

【請求項4】 上糸よりもインクジェット液滴の直径を小さく構成し、上糸の同一部分を複数のインクジェット液滴で染色可能な構成としたことを特徴とする請求項第1項乃至第3項いずれかに記載のインクジェット染色自動刺繍方法。

【請求項5】 基布に刺繍される上糸を搬送する機構と、該上糸の糸送り量を検出する手段と、該上糸を刺繍前にオンデマンド型インクジェット染色を行う手段と、染色済上糸を後処理する手段と、刺繍パターン情報と糸送り量検出情報とに基づき上糸染色データを作成する手段と、該染色データに応じて上糸をインクジェット染色するとともに、刺繍パターン情報に応じて基布を移動しつつ後処理された染色済上糸を用いて自動刺繍することを特徴とするインクジェット染色自動刺繍装置。

【請求項6】 基布に刺繍される上糸を搬送する機構と、該上糸の糸送り量を検出する手段と、該上糸を刺繍前に上糸の太さよりも小さいか或は糸直径の $1/2$ 以下乃至は $75\mu\text{m}$ 以下のインク滴を吐出するオンデマンド型インクジェット染色を行う手段と、刺繍パターン情報と糸送り量検出情報とに基づき上糸染色データを作成する手段と、該染色データに応じて上糸をインクジェット染色するとともに、刺繍パターン情報に応じて基布を移動しつつ染色済上糸を用いて自動刺繍することを特徴とするインクジェット染色自動刺繍装置。

【請求項7】 上記インクジェット染色自動刺繍装置は糸の太さに応じてインク滴数を変える手段を備えている請求項第5項又は第6項に記載の上記インクジェット染色自動刺繍。

【請求項8】 上記インクジェット染色自動刺繍装置は、上記刺繍パターンをカラー表示するディスプレイと、メモリされているカラー情報を変更する色指定手段とを有し、変更されたカラー情報で上記刺繍パターンを形成する請求項第5項乃至第7項いずれかに記載のインクジェット染色自動刺繍装置。

【請求項9】 上記インクジェット染色手段は糸の送り方向に色の異なる複数のノズルを糸の送り方向に複数備えている請求項第5項乃至第8項いずれかに記載のインクジェット染色自動刺繍装置。

【請求項10】 上記インクジェット染色手段は糸の送り方向に吐出量の異なる複数のノズルを備えている請求項第5項乃至第9項いずれかに記載のインクジェット染色自動刺繍装置。

【請求項11】 上記インクジェット染色手段は糸の送り方向に対して吐出口の配列方向を若干傾けている請求項第5項乃至第10項いずれかに記載のインクジェット染色自動刺繍装置。

【請求項12】 上記刺繍パターン以外に糸の染色パターン（細部の濃度変化又は複色色混在割合）に応じてインクジェット染色手段のインク滴吐出割合を変更する手段を備えている請求項第5項乃至第10項いずれかに記載のインクジェット染色自動刺繍装置。

【請求項13】 糸調子・布厚み・刺繍糸太さに応じた染糸長さ・インクジェット液滴数を最適設定する手段を備えた請求項第5項乃至第12項いずれかに記載のインクジェット染色自動刺繍装置。

【請求項14】 糸の先端部を空送りして、上記上糸の非染色部を刺繍パターン部外に仮刺繍する手段を有する請求項第5項乃至第13項いずれかに記載のインクジェット染色自動刺繍装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、刺繍パターン情報に基づいて基布上に自動刺繍を行う自動刺繍機能を有する自動刺繍方法及び装置に関し、具体的にはミシンであって、刺繍パターンに付随する色情報に応じて上糸をインクジェット染色を適宜行いつつ自動刺繍を行うインクジェット自動刺繍方法及び装置に関する。

【0002】

【従来の技術】業務用の自動刺繍装置や自動刺繍機能を有する家庭用のミシンはすでに製品化され普及しているが、従来のそれらの装置では刺繍用上糸を指定色に応じて取り替える必要があり複数色の刺繍を行う場合には色事に刺繍パターン情報を作成しておき上糸を取り替えながら順次色ごとに重ねて刺繍を行う必要があり、多色の刺繍パターンを自動刺繍する際には多大な時間と労力とを必要としていた。また、さまざまな色の刺繍用上糸を用意する必要があり、逆に言えば刺繍色の指定は刺繍用上糸の色数に限定されの微細な色調の刺繍は實際上不可

能であり、たとえば濃い緑色から黄色までの連続的な色調変化（グラディエーション）を用いた刺繍を行おうとしてもその色調数に合わせて刺繍用上糸を準備して上糸を順次交換しながら刺繍しなければならず刺繍の表現力が制約されていた。

【0003】近年インクジェット技術を用いた捺染装置が実用化され高精彩なプリント生地が簡略な工程で生産されるようになってきたが、刺繍のような立体感のある表現は難しく刺繍の良さが見直されている。また、従来より糸捺染技術として、経糸捺染と呼ばれる技術があり、経糸が緒巻からでて綜統を通るまでの間に捺染ロールを通る様にしたもので、経糸が織り込まれて行くのと同じ速さで徐々に捺染されてゆくものと解し織と呼ばれ、まず地色に染めた糸を経糸として、これに15センチおきぐらいに緯糸を緯糸として打ち込み、仮り織した後、織機からはずして捺染した上で再び緒巻にまきとって仮り織の時に打ち込んだ緯糸を解し抜きながら本番の緯糸を織り込んでゆく2つの代表的な方法がある。この糸捺染技術の一例として織り上げる前の経糸を捺染ロールではなくインクジェット技術を用いて行う方法が特

公昭59-42093号公報に開示されており捺染の表現力向上が可能とされている。上記公報では製織と同時に織組織と同調した模様を得るために、ノズル径が80μmの孔径を有する染液噴出ノズルから染液を圧力作用、電界作用などにより噴出させ、噴出する染液の量あるいは飛翔方向を織物組織に同調した信号（具体的には糸の上下動作）に従って制御することにより製織と同時に経糸捺染している。このため、実際に吐出したインク滴は150μm以上になり、通常の糸の太さよりも大きく、結果的に、インク滴のあふれや滲みのために所望の精度の染色を達成出来ない。しかも、糸の上下動作に応じて、インクの染色を切り替えているために、インク滴の到達状況が糸の変動に左右されやすく精度が低下してしまう。また、この公報により布化された織物はさらに後処理を布と共に行われているため質の低下を防ぐことは出来ない。

【0004】しかも、上記公報の構成は、複雑な模様を織り込むために染液の量あるいは飛翔方向を制御するためのインクジェット装置は複雑かつ大型のものとなり製織装置のような大型の装置でも組み込むことは難しく、表現力の点でも布上にインクジェット装置で自在な模様を捺染する前述のインクジェット捺染方法に劣ることから広く実用されていない。

【0005】

【発明が解決しようとしている課題】本発明の目的は、比較的小型の装置で所望の染液量或は、染色パターンを簡単に得ることの出来るインクジェット染色自動刺繍方法を提供することにある。

【0006】本発明の他の目的は、インクジェット技術を応用して刺繍の立体的な表現力を生かした上で高精彩

な色表現を操作性に優れかつ簡易な構成のインクジェット自動刺繍装置の提供を目的とするものである。

【0007】

【課題を解決する手段及び作用】本発明によれば、刺繍パターン情報と糸送り量検出情報とに基づき上糸染色データを作成し、染色データに応じて上糸をインクジェット染色するとともに、刺繍パターン情報に応じて基布を移動しつつ自動刺繍するインクジェット染色自動刺繍装置、より詳しくは、糸送り量検出手段を上糸に当接するとともに回転可能に支持された回転体の回転量を検出する回転量検出部と回転量から糸送り量を演算する糸送り量演算部とで構成し、糸送り量の原点を自動刺繍開始時にインクジェット染色部にある上糸上に設定するとともに、自動刺繍開始時に針先から糸送り量の原点までの余分な上糸を、基布上の刺繍開始位置と上糸の糸送り量原点とが一致するように刺繍パターン情報に応じて仮刺繍パターン情報を作成して基布上に仮刺繍する、あるいは、仮刺繍時の糸送り量に基づいて基布の刺繍特性を推定するとともに、刺繍特性に応じて糸調子および染色データの補正を行い、さらには、上糸よりもインクジェット液滴の直径を小さく構成し、上糸の同一部分を複数のインクジェット液滴で染色可能な構成とすることで、インクジェット技術を応用して刺繍の立体的な表現力を生かした上で高精彩な色表現を上糸切り替えを基本的に不要として操作性および刺繍速度に優れかつ簡易な構成のインクジェット染色自動刺繍装置を提供することが可能となった。

【0008】

【実施例】

（第1実施例）図1に本発明の第1実施例のインクジェット染色自動刺繍装置における、上糸のインクジェット染色部及び刺繍部の主要構成を示す。本実施例のインクジェット染色自動刺繍装置における上糸の染色・刺繍工程を簡略に説明すると、上糸ボビン受けに回転可能に支持された上糸ボビンに巻かれている刺繍用上糸はまず、上糸の送り量を検出して染色位置など設定するための糸送り量検出部材であるロータリーエンコーダ付きのスプールを周回した上で、インクジェット染色の前処理部に送出されてにじみ抑制剤などから構成される前処理液を一樣に塗布された上でインクジェット染色部に送られる。インクジェット染色部において刺繍パターン情報と糸送り量検出情報に基づいて作成された染色データに応じて、上糸の移動に同期させてインクジェット染色装置で各色指定数のインクジェット液滴を打ち込み上糸を染色する。染色された上糸はインクジェット染色の後工程として染色液の定着・発色を行う後処理部で加熱・スチーム処理などを受けた後刺繍針の針先へ送出され刺繍パターン情報に応じて駆動される刺繍針・下糸・基布自在移動装置とによって自動刺繍される。

【0009】あらかじめ設定された刺繍パターン情報に

基づいて所定の上糸を用いて自動刺繍する工程は従来の自動刺繍装置と同様の構成が基本的に適用可能なので自動刺繍部の詳細な構成及び動作の詳細な説明は省き、本発明の特徴とする上糸の自動染色工程及びそれに関連する自動刺繍部の一部について詳細に説明する。

【0010】本発明のインクジェット染色自動刺繍装置では刺繍パターン情報に基づいて上糸のインクジェット染色を行いつつ自動刺繍を行うが、その際には上糸のどの部分をどのように染色するかを設定することが必要である。また、実際に刺繍をスタートする針先部からインクジェット染色部までの上糸は自動刺繍を開始するまでに各工程を通過させておく必要があるため、あらかじめ染色するなどの特別な処理が必要である。そこで、本実施例では、自動刺繍開始時に前処理部を含めたインクジェット染色部よりも上糸ポピン側にある上糸上に糸送り量の原点を設定し、上糸原点から針先側の上糸を不要部分として設定して、いったん基布上に仮刺繍を行い、自動刺繍完了後に仮刺繍された余分な上糸を解し除去する構成としている。仮刺繍を行う位置は刺繍パターン情報から判断してそれと基布上で重ならずかつインクジェット染色された上糸の先頭部が針先に到達した時点で基布上の刺繍開始部に基布がセットされる様に仮刺繍パターンを作成する様にしている。

【0011】本実施例では図2に示すように、基布上の刺繍開始位置と仮刺繍開始位置とを同一に設定している。図2(A)は、仮刺繍開始位置から刺繍パターンと重ならない位置に仮刺繍を行って再び仮刺繍開始位置即ち、刺繍開始位置までにいたる仮刺繍に必要となる上糸の長さ、上糸原点から針先までの上糸の長さなどが等しくなる様に仮刺繍パターンを設定している。その際、基布の材質・厚みなどや上糸の材質・太さなどによって刺繍パターンを再現するために必要となる上糸の長さが異なったり上糸の糸調子（最適な張力）が異なるなどの刺繍特性を推定しながら仮刺繍を行い、刺繍特性に応じて上糸原点及び染色データおよび仮刺繍パターンの再設定を行うようにしても良い。この染色データの自動補正は実際の自動刺繍時にも行うことが可能であり、インクジェット染色部から針先部の上糸分での若干の補正誤差（遅れ）が生じても基布上に刺繍模様として現れない上糸の部分に収めることが可能なので実用上問題は無い。また、基布の材質・厚み、上糸の材質・太さなど刺繍特性に関する補正データをあらかじめ何例か作成しておき、使用者が各々設定する様にして刺繍特性の補正を行える様にしても良い。

【0012】また、図2(B)は仮刺繍の変形例で、刺繍パターンの刺繍面積が仮刺繍面積よりも十分に大きい場合には、刺繍パターンの下地に仮刺繍を埋め込む様に仮刺繍パターンを設定することが選択可能な様に構成しても良く、その場合は仮刺繍された上糸の除去は不要となる。

【0013】本実施例の変形例として、上糸をセットした後に手動で上糸を針先部から引き出しながら糸送り量検出情報に基づいて染色を行い、染色された上糸部の先端が針先の穴位置に来る様に手動で設定してから自動刺繍を開始するようにしても良い。ただし、本実施例では上糸の染色前処理・染色処理・染色後処理の各々で処理液塗布・インクジェット染色・加熱など各工程での処理時間に制約条件があるので所定の糸引き出し速度での上糸の手動設定が必要である。その際に糸送り量検出情報に基づいて上糸の送り出しに制動機構を設けるなどして送り出し速度を所定の範囲に収めるようにしても良い。

【0014】また、刺繍パターン情報が連続的な模様でなく孤立した部分がある場合にも上記説明した仮刺繍の手法を用いることにより上糸の再設定を行わずに対応可能で連続的なインクジェット染色自動刺繍が実現できる。その際には、自動刺繍装置で周知の自動糸きり機能を併用するなどして仮刺繍された上糸の除去を容易にしても良い。

【0015】インクジェット染色の前処理として、本実施例では汎用の糸を使用可能とするために上糸の前処理機能を設けている。インクジェット染色自動刺繍装置専用の刺繍上糸を指定し、専用の上糸にあらかじめ前処理を施しておけばインクジェット染色自動刺繍装置においてこの工程を省いた構成とすることも可能である。本実施例におけるインクジェット染色の前処理は主ににじみ防止を目的としてしている。前処理液としてはインクジェット捺染装置で利用されている布処理液が適用可能である。本実施例では不図示であるが、布処理液を塗布後に絞りローラによって余分な前処理液を除去している。

【0016】図3にインクジェット染色部の構成を示す。本実施例では上糸の進行方向に沿ってBK・C・M・Yの4色の染色液を吐出する各々8ノズルずつのインクジェットヘッドを設けている。各々のノズルから吐出される染色液の吐出量は上糸の直径よりも小さく設定しており、本実施例では真球に換算すると約40μmの染色液直径である。染色液の直径はインクジェット染色を行う場合糸の直径よりも小さく設定することが好ましいが、吐出された染色液が糸に着弾した場合に約2倍程度に瞬時に広がるので、より好ましくは使用される糸の1/2以下であれば良い。本実施例で用いた上糸は所定の糸調子（張力）で送出した場合、約120μmの直径であるので、糸の同一部分に対して染色濃度にもよるが各色複数の染色液を着弾させられる様に構成している。すなわち、上糸の送り出し量の原点からX画素目の位置にシアン4液滴・イエロー4液滴を着弾させてグリーンに染色する場合はC1・C3・C5・C7・Y1・Y3・Y5・Y7の8ノズルの位置に上糸のX画素目が対向した時点でタイミングをとって吐出させる。ノズルと上糸の距離と上糸の送り出し速度と染色液の吐出速度との関係で着弾位置がずれるので、実際にはそのずれ量を補正

したタイミングで吐出を行う。従って、本実施例では染色液の着弾順序はC1・C3・C5・C7・Y1・Y3・Y5・Y7の順となる。本実施例では同一色の染色液は各色最大8液滴まで同一画素に着弾させる様にしているが低濃度（染色液滴数が少ない場合）の糸芯部への染色液浸透を考慮して着弾間隔を広げる様に使用ノズルを設定する様に制御している。たとえば、シアンを4液滴以下で着弾させる場合は奇数ノズルを用い、それ以上の場合は順次偶数ノズルを使用する様にしている。また、

ノズルごとの使用頻度を均一化させるために偶数ノズルから使う場合と奇数ノズルから使う場合さらにはその昇順・降順を画素ごとに変えている。ノズルの使用頻度均一化の手法として使用ノズルの指定をランダム指定するように乱数回路を用いても良い。

【0017】本実施例で用いたインクジェットヘッドはノズル間隔が各色内約70μm色間は564μmの4色合計32ノズルの一体型ヘッドであり、染色画素密度は360dpi相当で最大駆動周波数は6.12kHzであるので、最大糸送り速度は約432mm/secである。従って、縫い目ピッチ、基布送り速度、布厚み・材質などにもよるが、ぬい速度1800回針/分・縫い目ピッチ5mm程度の自動刺繍の速度には十分に対応することが可能であり、インクジェット染色部の染色速度によって自動刺繍の速度が制限されることはない。また、さらにインクジェット染色の速度（最大糸送り速度）を大きくするためには、種々の方法が可能であるが、たとえば本実施例の各色のノズル数を倍にして奇数ノズルと偶数ノズルを画素交互に用いる様にすれば良い。

【0018】図4は、上記インクジェットヘッド構成の濃淡変化可能変形例を示す。(A)は濃淡ヘッドの構成の分解図、(B)はその共通液室の拡大図である。600は4つのフィルター700を区画化されたインク室に対応させて備えるインク受けようのカバーで、図のような形状のパネ500を介してヒータボード100にノズル、吐出口、共通インク室形成用のオリフィスプレート1300が一体化された天板1500を押圧する。この構成の詳細は、市販されているキヤノン（株）製BJ方式のインクジェット記録ヘッドを参照すると理解出来る。図4で新規な構成は、(B)に示すインク室構成で、図3で示したY、M、C、Bkの各ノズルを濃度の異なる同色インクで置き換えることで、階調性の高い染色を可能にすることができるものである。各インク室10a、10b、10c、10dは夫々壁30a、30b、30cによって仕切られ、インク受部20a、20b、20c、20dから、異なる濃度のインクを受け取る。この場合、カラー記録はできなくなるが、インク室を増加すれば、カラー記録はもとより、各色の階調記録を依り高度に達成することができる。

【0019】図6にインクジェット染色部の構成変形例として、刺繍用の上糸が染色液滴よりも著しく大きい場

合の例を示した。図6では上糸に対して対向する2つのインクジェットヘッドを用いて両側から染色を行う様にしている。図7は2つのインクジェットヘッドを完全には対向させずに構成した例で、染色液の吐出時に発生するインクミストが対向するヘッドのフェイス面に当たらない様にしている。

【0020】図8は、本実施例における記録ヘッドのメンテナンス機構の説明図であり、上糸と記録ヘッドの間に、不使用時や吸引回復時に用いる保護・吸引キャップ、フェイス面に付着したインクミスト・糸くずなどの異物をふき取るワイピング部材及び非染色時に染色液を吐出させて回復する予備吐出受けである吸収部材が必要に応じて挿入される様に構成されている。

【0021】インクジェット染色部で染色された上糸は本実施例では染色の後処理として加熱処理を施す様にしている。前処理液、染色液の特性によってはこの後処理を省略することも可能であり、たとえば、自動刺繍後にアイロンなどで加熱処理するなどしても良い。

【0022】図5に本実施例のインクジェット染色自動刺繍装置の制御ブロック図を示す。図5で、刺繍パターンデータ入力装置から入力された刺繍パターン情報を基に、前述のごとく、上糸の染色位置及び染色条件（色・染色液滴数）からなる染色データを作成し、仮刺繍時及び刺繍時の刺繍状態に応じた糸送り量とから染色データの補正を順次行いながらインクジェット染色自動刺繍を行う。刺繍パターン情報はあらかじめ自動刺繍装置のROMなどの記憶装置に内蔵されたパターンから選択しても良い。

【0023】ここで、図5の構成を簡単に説明する。1は装置の使用者が操作する操作パネルで、装置内にフロッピーやランダムアクセスメモリ等の刺繍パターンメモリ手段6に保存されている刺繍パターンをコード或は不図示のディスプレイ等に表示される中から指定する指定手段2と、刺繍される布の厚さや材質等の布種を指定する布種指定手段3と、刺繍パターンの一部または全部の所定色を所望の色に変換することができる色指定手段4を備えている。5は刺繍の織り込み条件の補正手段で、布種指定手段3、色指定手段4からの情報によって、使用目的の糸色がどの程度の縫代としての折り返し量を必要とするかを補正する。この情報はCPU7を介して条件補正として染色データ形成手段12へ送られる。この縫代は、パターンに応じたその色の糸がパターンの実質的な表面積分に相当する上糸の量に加えて、そのパターンによる折り返し回数と布の厚みの変化量の積が実質的な補正量となるものと本例は設定している。

【0024】10は、指定された刺繍パターンに応じて色指定手段4（変更がない場合は不要な情報となる）を考慮して、色情報を含む刺繍パターンをインクジェット染色ユニットが備えるインク色に対応した色、パターンに分解するデータ処理手段である。本実施例は、Y、

M、C、Bkの4色に変更するもので、データ処理手段10で処理された変換データは、各インク別パターンメモリ11に一時的に蓄えられる。19は前述した糸送り量検出手段で、上糸供給部20から供給される糸の送り量を正確に判別し、その出力を染色データ形成手段12へ送る。染色データ形成手段12は、インク別パターンメモリ11の情報を上記条件補正手段からの補正を勘案して最終的な染色用の色別のデータを糸送り量検出情報とに基づいてデータ形成し、Y、M、C、Bkヘッドドライバ13がこれを受けてヘッドの色ごとの配置による遅延量のタイミング補正を考慮してオンデマンド型(BJ方式)インクジェット染色ユニット14を駆動する。

【0025】インクジェット染色ユニット14の構成は前述した構成のいずれでもよいが、本ユニットの直前には未染色糸の染色を向上させるための公知の前処理を実行する前処理部15が設けられている。無論、未染色糸が予めこの公知の前処理が施された上糸であることのほうが装置構成を簡略化できるので好ましい。16は公知の後処理部で、本例では、染色ユニット14で発生した水分や回復処理等で、排出されるインクを吸収する液体吸収部材(定期的に保水されるものであっても良い)17を染色ユニット14から導き、加熱手段18により高温蒸気による後処理を実行している。これは、染色ユニット14における液体吸収部材の液体吸収能力を向上するとともに、液体の水分を後処理工程に効率的に利用するものである。本例は上糸に染色する構成であるため、単位時間に処理する面積は布捺染に比べてきわめて微小であるため、このような構成で効率よく、小型の処理装置で十分な効果が得られる。従って、この後処理部16を通過した糸はパターン染色済の糸として、ミシン機構9に供給され、ミシン本体ドライバ8により、指定された色、パターンメモリの情報に応じて、布移動と縫い針移動とが相対的に行なわれて、刺繍済の布が製造される。

【0026】21は、前述した染色開始の原点を示す情報で、後処理工程以前でのいずれの位置での判定情報であっても良い。尚、原点情報21は、前述した仮刺繍から、本刺繍への切り替えタイミングとして利用される。

【0027】以上説明した様に、刺繍パターンに応じて刺繍用の上糸をインクジェット染色しつつ自動刺繍を行うようにしたことで、上糸の交換をしなくてもさまざまな色調の刺繍を容易に行える様になった。

【0028】(第2実施例)図9は本実施例の第2実施例のインクジェット染色自動刺繍装置に用いられるインクジェット染色部の構成図である。本実施例では、刺繍用上糸の太さに応じて最適な染色を行える様に、操作パネルで指定された上糸太さに応じて使用するインクジェットノズルの数を変えて染色する例である。上糸の太さの指定はパネル指定でも、糸送り経路上に設けた光学センサなどの太さ検出手段で自動判定しても良い。図9で

上糸の基準は糸ガイド部材のある側(この例では下側)であるので糸の太さが大きくなると下側のノズルに加えて上側ノズルを適宜追加する様にしている。

【0029】図10は本実施例の変形例で、糸ガイドとインクジェットヘッドとが対向する位置関係となっていて上糸の太さが大きくなっても上糸の中心がインクジェットヘッドの中心からずれない構成とした上で、周辺部よりも中心部のノズル密度を高くした例を示す。

【0030】以上説明した様に本実施例では、刺繍用上糸の太さが変わっても最適のインクジェット染色が行える。

【0031】(第3実施例)前記実施例では下糸は染めずに単色のものを使用する例を示したが、図11では下糸も上糸と同様にインクジェット染色して自動刺繍を行える様に構成したことで、基布の両面にさまざまな色の刺繍を行える様にした。

【0032】

【発明の効果】本発明によれば、刺繍パターン情報に応じて上糸をインクジェット染色するとともに、刺繍パターン情報に応じて基布を移動しつつ自動刺繍する構成とすることで、インクジェット技術を応用して刺繍の立体的な表現力を生かした上で高精彩な色表現を上糸切り替えを基本的に不要として操作性および刺繍速度に優れかつ簡易な構成で達成できるインクジェット染色自動刺繍装置を提供することが可能となった。

【図面の簡単な説明】

【図1】本発明の第1実施例のインクジェット染色自動刺繍装置における、上糸のインクジェット染色部及び刺繍部の主要構成を示す。

【図2】基布上の刺繍開始位置と仮刺繍開始位置とを同一に設定する説明図で、(A)は仮刺繍開始位置から刺繍パターンと重ならない位置、(B)これらが重なる位置関係をしめす。

【図3】インクジェット染色部の構成例の説明図である。

【図4】インクジェットヘッド構成の濃淡変化可能変形例を示す。

【図5】本実施例のインクジェット染色自動刺繍装置の制御ブロック図を示す。

【図6】インクジェット染色部の構成変形例の説明図である。

【図7】インクジェット染色部の構成変形を2つのインクジェットヘッドを完全には対向させずに構成した例である。

【図8】本実施例における記録ヘッドのメンテナンス機構の説明図である。

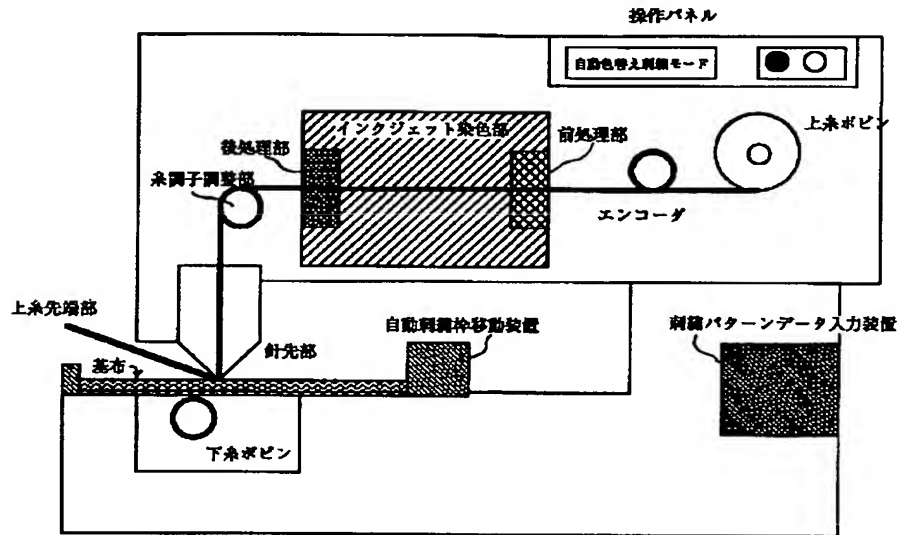
【図9】本実施例の第2実施例のインクジェット染色自動刺繍装置に用いられるインクジェット染色部の構成図である。

【図10】本実施例の変形例で、上糸の中心がインクジ

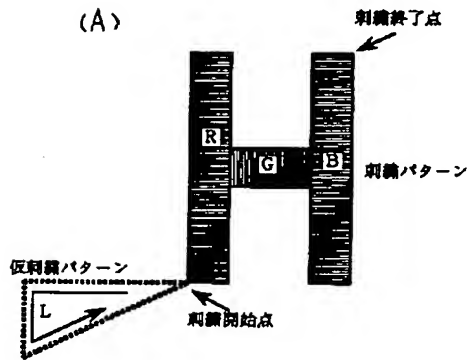
エットヘッドの中心からずれない構成とし、周辺部よりも中心部のノズル密度を高くした例を示す。

【図11】 下糸も上糸と同様にインクジェット染色して*

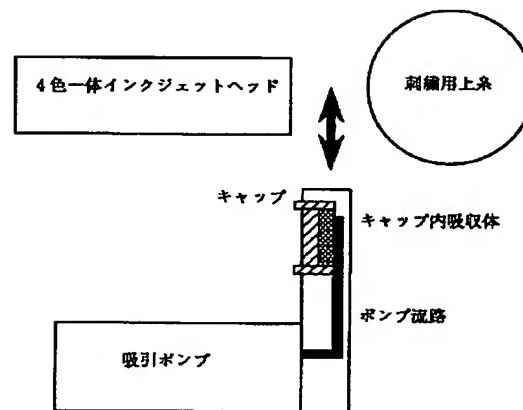
【図1】



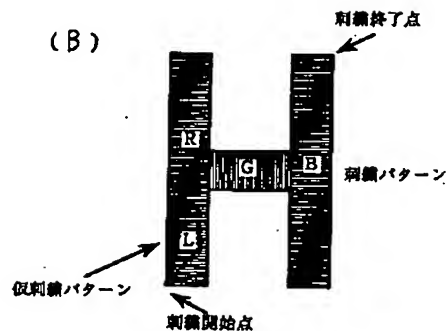
【図2】



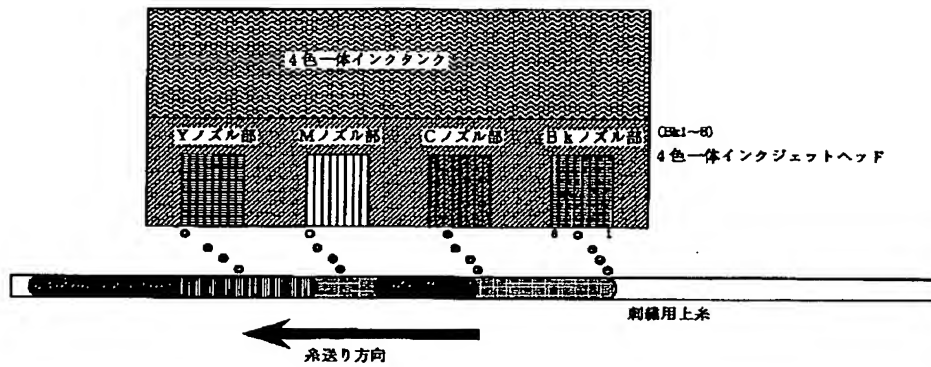
【図8】



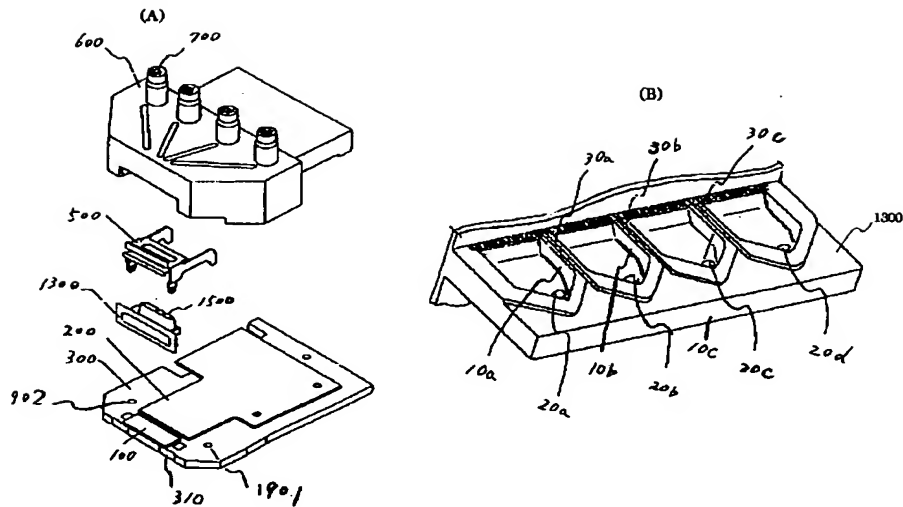
(B)



【図3】



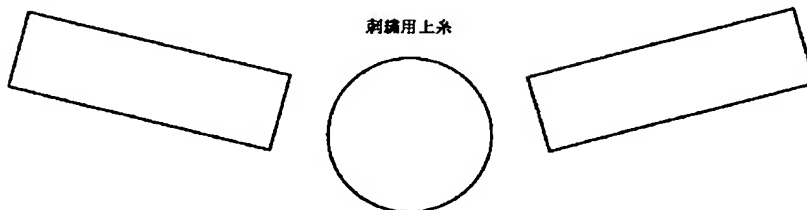
【図4】



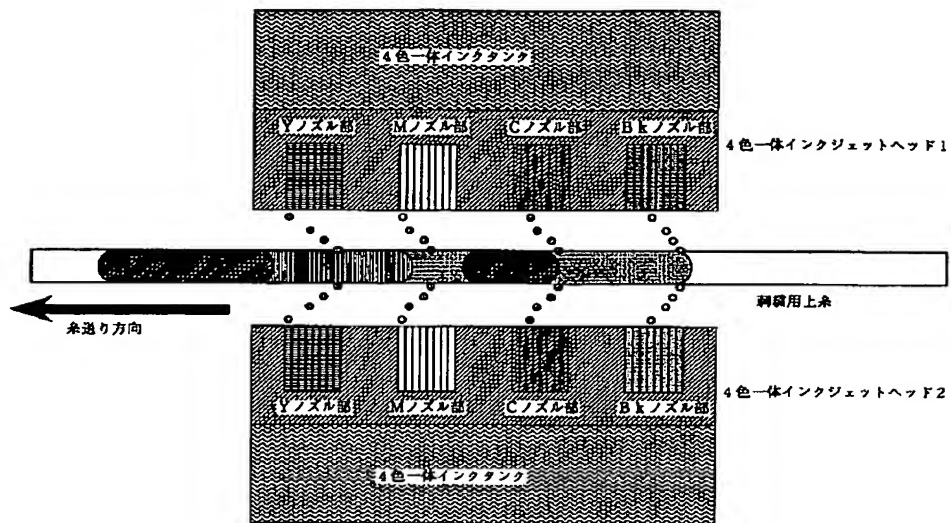
【図7】

4色一体インクジェットヘッド1

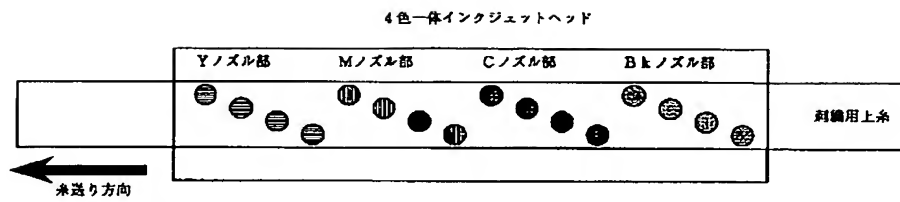
4色一体インクジェットヘッド2



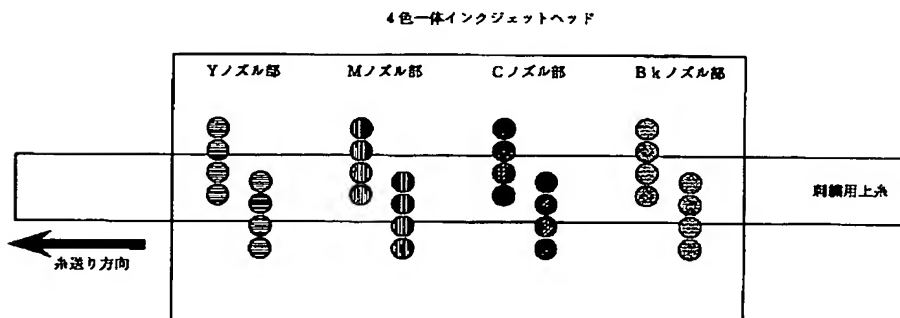
【図6】



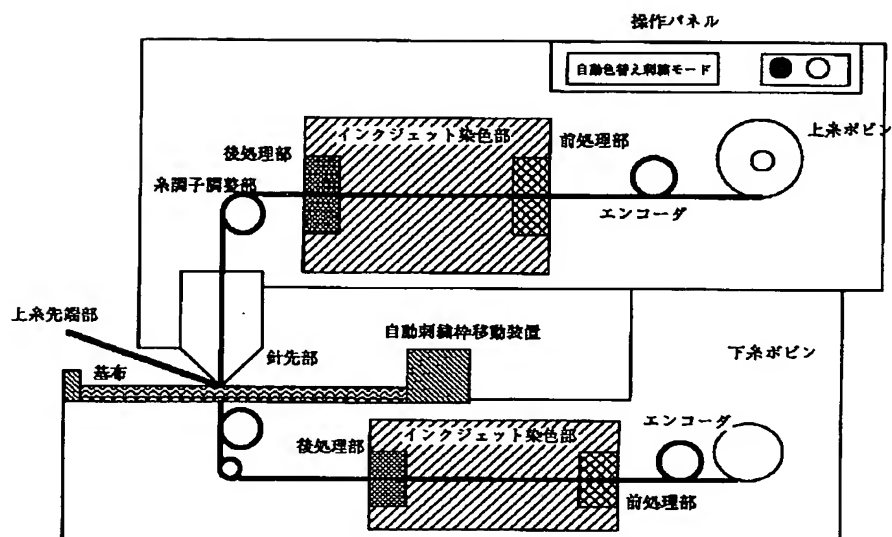
【図9】



【図10】



【図11】



フロントページの続き

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